

Flexible and Safe Control of Mobile Surface Systems, Phase I

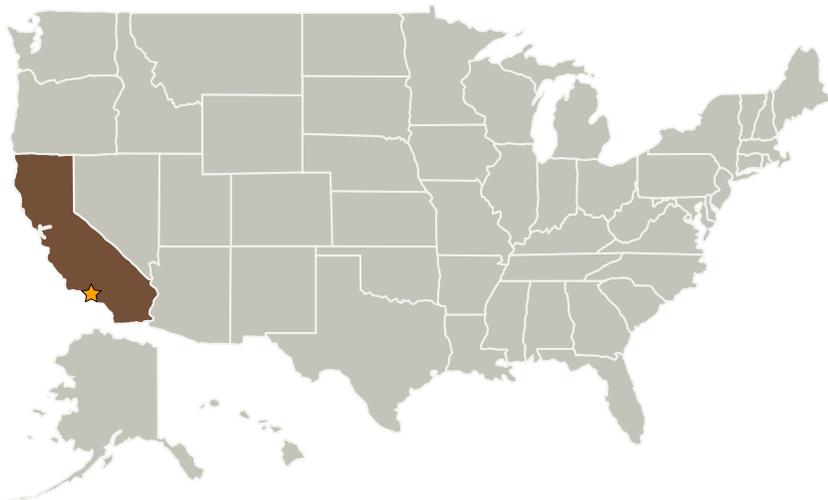


Completed Technology Project (2005 - 2005)

Project Introduction

The primary innovation of this work is a novel Petri net based approach for safe and flexible control of highly capable mobile surface systems, such as long-duration science rovers, crew surface systems, multi-robot and human-robot teams. The traditional approach of time-based sequence of commands will not be adequate for commanding and coordinating those surface systems because it does not support concurrent tasks and team coordination. Those surface systems will best be supported by a state-based control architecture that explicitly models the states and their interactions. Petri net is a mature and flexible formalism for representing such a state-based control architecture. This research will develop novel Petri net based techniques to enable 1) explicit modeling and control of concurrent tasks, team coordination, and mode switching, and 2) dynamic reconfiguration of a Petri net during its execution to support onboard planning and human/robot interactions. The result of the proposed effort will be a Petri net based executive that can be integrated into a robot planning and control system for flexible and safe control of mobile surface systems. In addition, a graphical tool will also be developed to enable operators to visualize, edit, and analyze the Petri nets.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California
IA Tech, Inc.	Supporting Organization	Industry	Los Angeles, California

Primary U.S. Work Locations

California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Kam S Tso

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.3 Aeroelasticity